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(54) **Air bag manufactured using uniform woven cloth**

(57) Fabric used for making an Au air bag for a vehicle manufactured from a woven cloth, wherein the warp and weft (6, 7 Fig 2) densities are equal and are higher than the density of a normal woven cloth.

Two pieces of this cloth 3a, 3b are cut to shape and sewn together to make an air bag 3, with an aperture for an inflator (2, Fig 4) which can be installed in a vehicle; the bag being inflatable by high pressure gas generated upon a collision.

A weaving machine for making the cloth is shown (in Fig. 3), wherein the density is increased by hitting the weft with a guide bar. The resultant cloth is usable up to the selvedge and has uniform tensile strength over its entire width.

FIG. 1

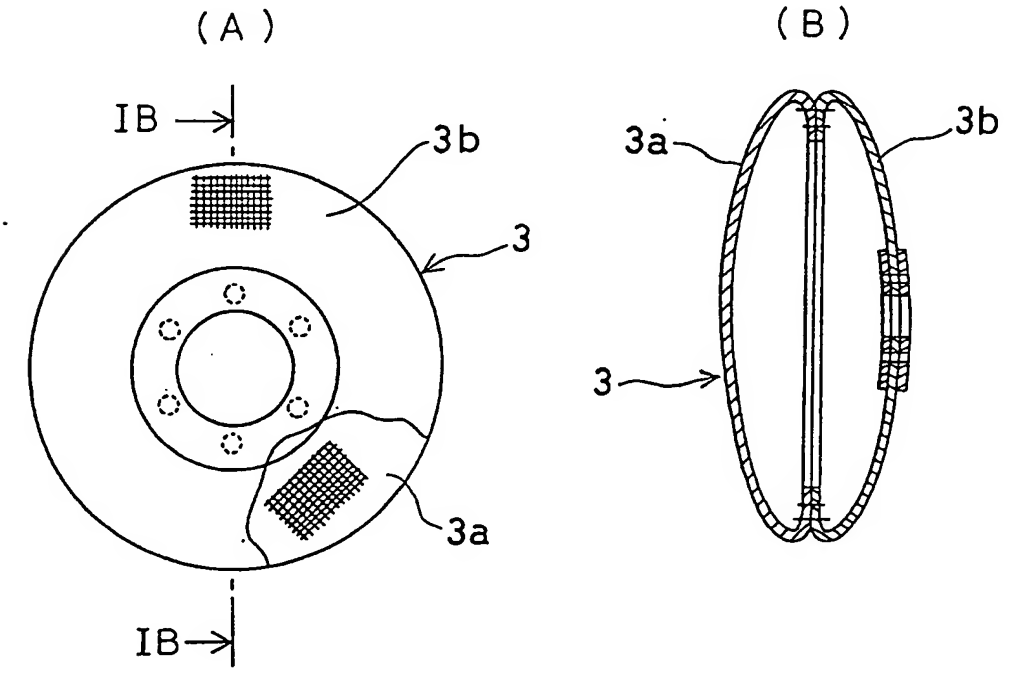

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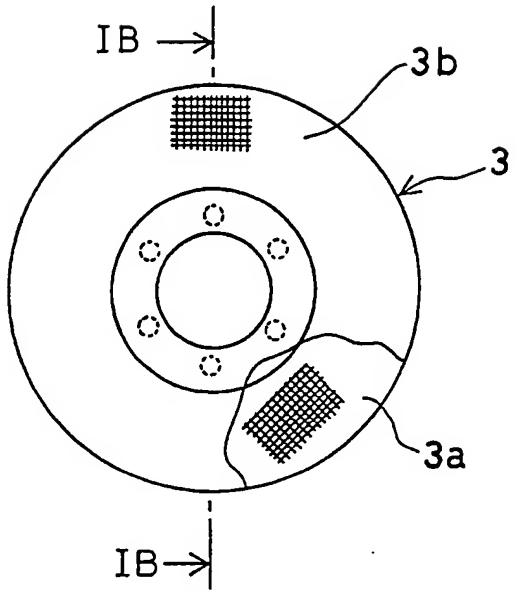
FIG. 1

(A)



(B)

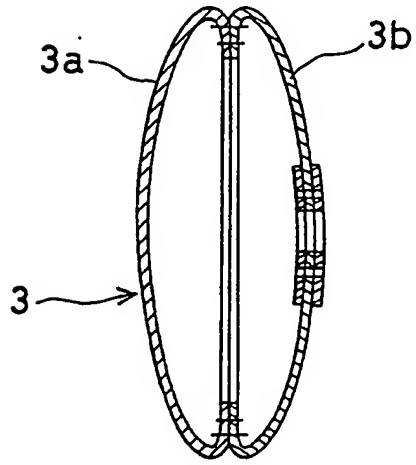


FIG. 2

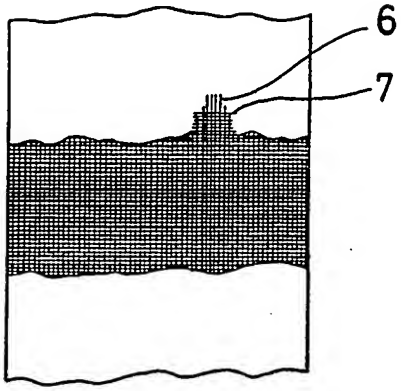


FIG. 3

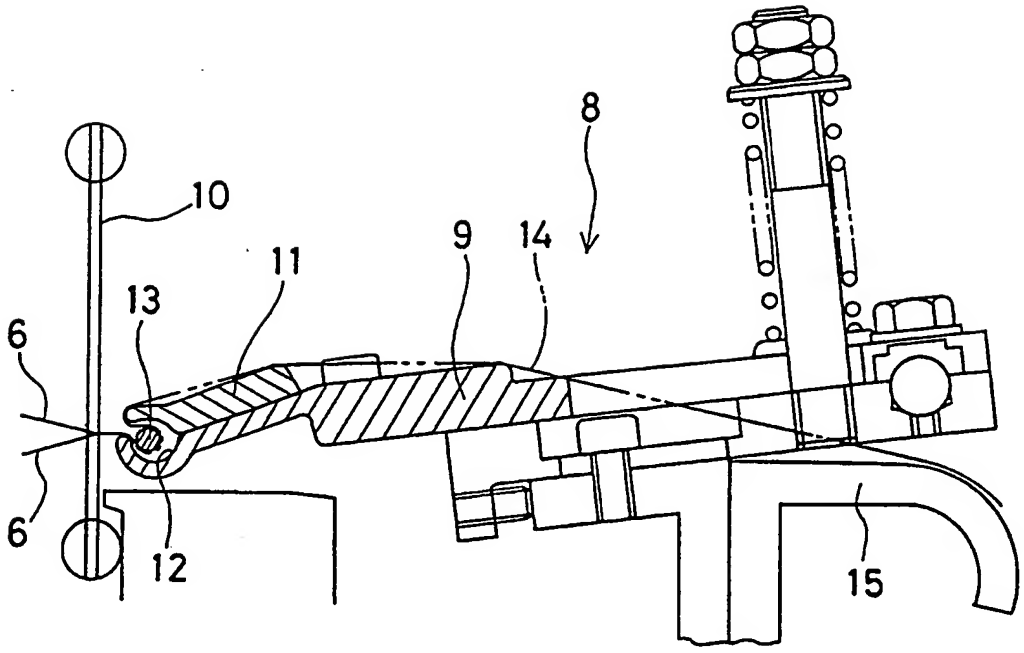


FIG. 4

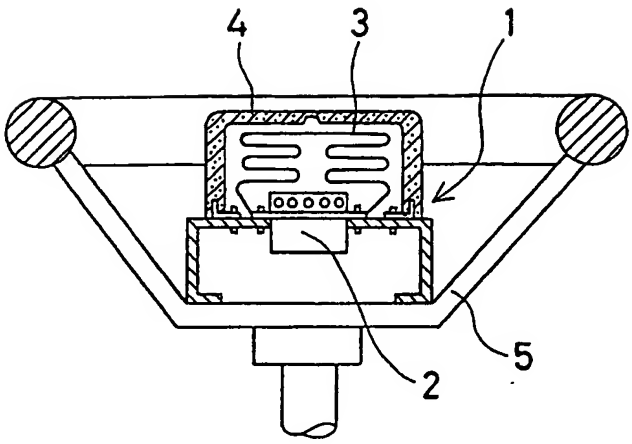


FIG. 5

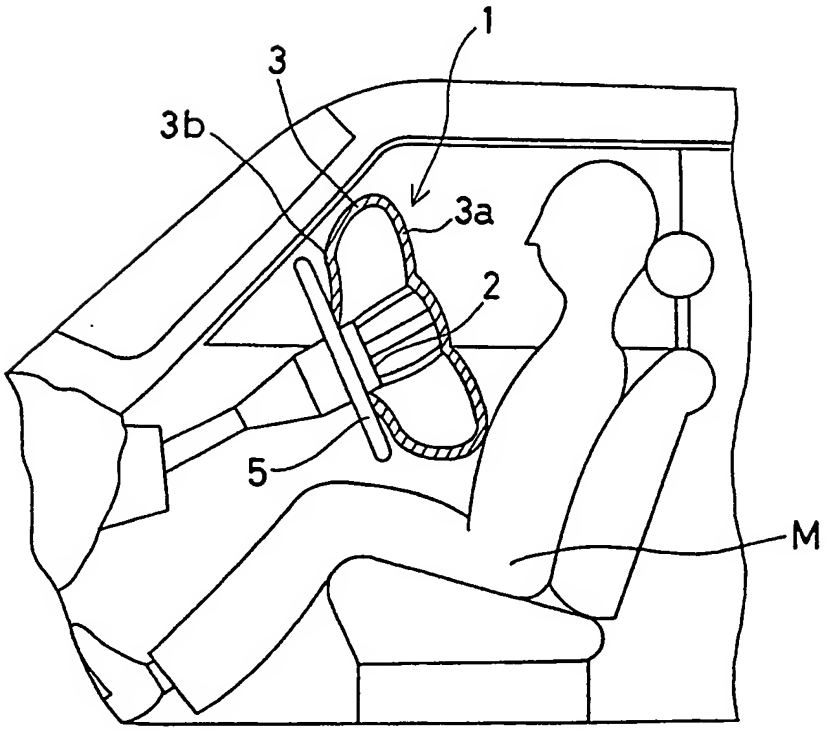
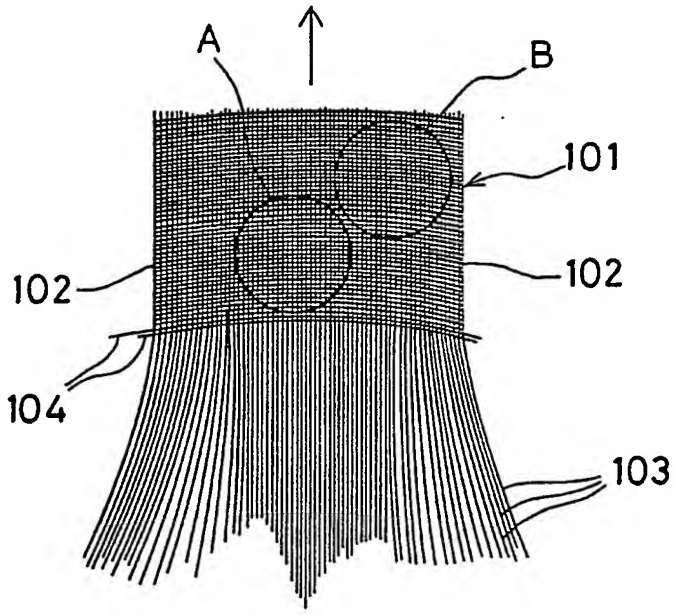


FIG. 6



BASE CLOTH FOR AIR BAG

The present invention relates to the cloth fabric used to make an air bag for protecting the occupant in an vehicle as it is inflated by reaction gas from an inflator when the vehicle is in collision.

An air bag unit, as provided on a fixed portion of a car body in front of a seat in a vehicle, plays an important rôle to protect an occupant of the vehicle from injury when the vehicle is in a collision; the air bag is inflated instantaneously by the pressure of reaction gas released from an inflator fixed on steering or on dashboard.

For example, as shown in Fig. 4, such air bag unit 1 comprises an inflator 2, which includes a chemical reaction of a gas generating agent initiated by a signal from a collosion detecting sensor when the deceleration of vehicle becomes higher than a certain level and the reaction gas formed in then ejected, and an air bag 3, the base of which is fixed onto the inflator 2 and which is inflated by the ejected gas. This air bag unit 1 is mounted, for example, on a fixed portion of a car body such as the center of the steering wheel 5 with the air bag 3 folded up and inside a coverig pad 4.

As shown in Fig. 5, the gas generating agent in the inflator 2 reacts when the vehicle is collided, and the air bag 3 is instantaneously inflated by the reaction gas thus generated. In so doing, the air bag 3 receives the driver M, who is thrown forward by inertia, and protects him from the collision against car body.

In an air bag 3 of conventional type, the air bag 3 for air bag unit 1 to be installed on the driver's seat is formed by sewing a piece of fabric 3a facing the driver M and another piece of fabric 3b to be fixed on a fixed portion of car body. An air bag for an air bag unit to be installed in a position other than the driver's seat is formed by sewing fabric cut into appropriate shape. The fabric 3a and 3b used is made of woven cloth in most cases.

The air bag 3 must fulfill the function of inflating instantaneously by high pressure reaction gas and receiving the occupant perfectly, and so the following conditions are required for the fabric of the bag:

(1) Warp and weft must be set to the same density;

(2) They must be set at far higher density than normal woven cloth; and

(3) Their strength must be equal in longitudinal direction and lateral direction.

However, when a cloth is woven, crimping generally occurs, in which the woven cloth is shrunk in the lateral direction. In general, the cloth for an air bag is woven in high density using thread of about 400 deniers. In weaving the cloth in such high density, stress often unavoidably occurs on the selvedge. Accordingly, it has been customary to weave the cloth by holding the selvege of base cloth and pulling the warp, using a template. However, when cloth is woven by holding only its selvedge the warp is more extensively pulled as it approaches toward the center of the weaving width. Thus, as seen in Fig. 6, the warp 103 is unavoidably stretched on the selvege 102 of the cloth 101. As a result, weft 104 is curved in the pulling direction of the warp 103, and the base cloth thus woven has partially a different density, and the elongation also differs partially. When the elongation and density differ partially, the strength of the cloth also partially differs between the selvege and the center. Therefore, the strength of the air bag will differ depending on if the cloth 101 is cut at the portion A or portion B.

Thus, in the conventional type of cloth for an air bag, the density of warp and weft differs partially and the strength is not uniform. Thus, the conditions required for an air bag as described above cannot be satisfied, and the function of the air bag cannot be fulfilled fully.

The object of the present invention is to provide a cloth for making an air bag, which can fulfill the functions of an air bag satisfactory and reliably.

According to the present invention a woven cloth for making an air bag to be inflated by reaction gas from an inflator is characterized in that the warp and weft are set in the same high density, and that the strength in the lateral direction is uniformly set.

The cloth for an air bag according to this invention can allow the air bag made therefrom to fulfill its functions perfectly when it receives the occupant reliably when it is inflated instantaneously by high pressure reaction gas, because its warp and weft are set in the same high density and because its strength in the lateral direction is uniformly set. Moreover, an air bag for an occupant other than in the driver's seat functions effectively because even the selvedge of the cloth is useable in many cases.

In the accompanying drawings:

Fig. 1 shows an example of an air bag made of the cloth according to the present invention, (A) being a plan view, and (B) a cross-sectional view along the line IB-IB in (A);

Fig. 2 is a face view of part of woven cloth to be used as in the bag of Fig. 1;

Fig. 3 represents an example of a weaving machine to weave the cloth of Fig. 2;

Fig. 4 is a schematic cross-sectional view of a typical installation of an air bag unit on a steering wheel;

Fig. 5 shows the condition when the air bag of Fig. 4 is inflated; and

Fig. 6 shows a cloth of conventional type used for an air bag when it is being woven.

As shown in Figs. 1(A) and (B), the air bag comprises a base cloth 3a installed face-to-face to the occupant M in the vehicle and another cloth 3b to be fixed on a fixed portion of car body, and it is formed by sewing up the marginal portions of the cloths 3a and 3b. In the example shown the cloths 3a and 3b are sewn up in such manner that

the thread directions intersect each other by an angle of about 45 degrees between these cloths. However, the direction of these threads may be in the same direction or the intersecting angle may be an angle other than 45 degrees.

As shown in Fig. 2, these base cloths 3a and 3b are woven with the same density for both warp 6 and weft 7 and in the higher density than the density of normal woven cloth. Also, the base cloths are made of woven cloth, in which the strength in the lateral direction is uniformly set.

Such woven cloth is woven, for example, by a weaving machine 8 using bar temple as shown in Fig. 3. Specifically, a cover 11 is mounted on a guide bar 10 of main body 9 of the weaving machine 8, and bar temple 13 is disposed in a space 12 formed between them. The woven cloth 14 is inserted into this space 12. After it is wound on the bar temple 13, it is sent toward the breast beam 15 and is finally wound up on a winder (not shown).

When the woven cloth 14 is woven, weft 7 is passed through between the warps 6, which are positioned up and down and on which a certain tension is applied. Then, the weft 7 is hit by the guide bar 10 toward the weaving end of the woven cloth 4 to increase the density of the weft 7. In this case, when the guide bar 10 moves back from the weaving end, the bar temple 13 is pulled up by the tension of the woven cloth 14, and the woven cloth 14 is held between main body 9 and bar temple 13 as well as between bar temple 13 and cover 11. As the result, the total width of the woven cloth 14 is tightened, and the weaving end does not move. When guide bar 10 hits the weaving end, the woven cloth 14 is loosened. Because bar temple 13 is separated from main body 9 and cover 11, the woven cloth 14 is wound up on the winder.

The woven cloth 14 thus woven has its warp and weft in the same density, and the density is higher than that of normal woven cloth. Moreover, no sag occurs on the selvedge of the woven cloth 14, and the woven cloth 14 has uniform tensile strength over the entire width.

Therefore, by cutting such woven cloth 14 to a suitable shape to make an air bag 3, according to the position where it is to be installed and sewing the pieces together, the air bag 3 thus made can reliably receive and cushion the occupant in the vehicle when it is inflated instantaneously by high pressure reaction gas.

CLAIMS:

1. A cloth suitable for making an air bag for a vehicle, which is a woven fabric wherein the warp and weft are set in the same high density and the strength in the lateral direction is uniformly set.

2. Cloth as claimed in Claim 1, which has a uniform tensile strength over its entire width.

3. A cloth as claimed in Claim 1, substantially as hereinbefore described particularly with reference to Fig. 2 of the drawing.

4. An air bag made by cutting and sewing pieces of fabric as claimed in Claim 1, 2 or 3.

5. An air bag as claimed in Claim 4, substantially as hereinbefore described with reference to Fig. 1 of the accompanying drawings.

6. A weaving machine for making cloth as claimed in Claim 1, substantially as herein described and shown.

7. The features herein described, or their equivalents, in any patentably novel setection.

Amendments to the claims
have been filed as follows

1. An air bag made by cutting and sewing pieces of cloth which is a woven fabric wherein the warp and weft are set in the same high density and the strength in the lateral direction is uniformly set.

2. An air bag as claimed in Claim 1, wherein the cloth has a uniform tensile strength over its entire width.

3. An air bag as claimed in Claim 1, wherein the cloth is substantially as hereinbefore described particularly with reference to Fig. 2 of the drawing.

4. An air bag as claimed in Claim 1, substantially as hereinbefore described with reference to Fig. 1 of the accompanying drawings.

5. A weaving machine for making cloth as claimed in Claim 1, substantially as herein described and shown.

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